

Amendments to the Claims

Please amend the claims as follows:

1. (currently amended) A semiconductor device comprising:
a substrate; and
a plurality of molded plastic stiffener components attached to a first surface of the substrate without an adhesive element, the stiffener components effective to increase rigidity of the substrate, wherein the substrate and the stiffener components are separate components that are attached and secured together.
2. (original) The device of Claim 1, wherein the substrate is selected from a group consisting of a laminated polymer, a polyimide layer, a bismaleimide triazine (BT) resin, an FR4 laminate, an FR5 laminate, a CEM1 laminate, a CEM3 laminate, and a ceramic metal frame.
3. (original) The device of Claim 1, wherein the substrate has a thickness of less than about 75 microns.
4. (original) The device of Claim 1, wherein the substrate has a thickness of less than about 50 microns.
5. (original) The device of Claim 1, wherein the substrate has a thickness of less than about 35 microns.
6. (previously presented) The device of Claim 1, wherein the stiffeners have a thickness of less than about 100 microns.
7. (previously presented) The device of Claim 1, wherein the stiffener components have a thickness of less than about 75 microns.

8. (previously presented) The device of Claim 1, wherein the stiffener components have a thickness of less than about 50 microns.
9. (previously presented) The device of Claim 1, wherein the stiffener components comprise a thermoplastic material.
10. (previously presented) The device of Claim 1, wherein the stiffener components comprise a thermosetting polymeric material.
11. (previously presented) The device of Claim 1, wherein the thermal coefficient of expansion of the stiffener components and the substrate correspond such that heating expands both the stiffener components and the substrate approximately equally.
- 12-15. (canceled)
16. (previously presented) The device of Claim 1, wherein the stiffener components comprise at least one cross member.
17. (previously presented) The device of Claim 1, wherein the stiffener components are in a form selected from the group consisting of a grid, a lattice, a grille, and a web.
18. (canceled)
19. (withdrawn) The device of Claim 1, wherein the stiffener components are sized to correspond to at least one of a length and a width of the substrate.
20. (canceled)
21. (withdrawn) The device of Claim 1, wherein the stiffener components are structured as an enclosure for containing an encapsulating material therein.

22. (withdrawn) The device of Claim 1, wherein the substrate comprises index holes.
23. (previously presented) The device of Claim 1, wherein the substrate is in reel form.
24. (previously presented) A semiconductor device comprising:
a substrate comprising a first surface, a second surface, and a periphery; and
a plurality of molded plastic stiffener components attached to the first surface of the substrate proximate the periphery; the stiffener components attached to the substrate without an adhesive element, wherein the substrate and the stiffener components are separate components that are attached and secured together.
25. (withdrawn) The device of Claim 24, wherein the stiffener components protrude from the first surface of the substrate.
26. (withdrawn) The device of Claim 24, wherein the first surface of the substrate comprises a recess and the stiffener components are secured to the substrate within the recess.
27. (withdrawn) The device of Claim 26, wherein the stiffener components are about level with the first surface of the substrate.
28. (previously presented) The device of Claim 24, wherein the stiffener components comprise at least one cross member.
29. (withdrawn) A semiconductor device comprising:
a substrate comprising a first surface and a second surface;
a first molded plastic stiffener component attached to the first surface of the substrate without an adhesive element; and
a second molded plastic stiffener component attached to the second surface of the substrate without an adhesive element;
wherein the substrate and the first stiffener component are separate components that are attached and secured together.

30. (withdrawn) The device of Claim 29, wherein the first stiffener component and the second stiffener component comprise different configurations.
31. (withdrawn) The device of Claim 29, wherein the first stiffener component and the second stiffener component comprise different dimensions.
32. (previously presented) The device of Claim 29, wherein the first stiffener components protrude from the surface of the substrate, and the second stiffener components are situated within a recess within the substrate and flush with the surface of the substrate.
33. (canceled)
34. (previously presented) A semiconductor assembly comprising:
a substrate having a first surface, a second surface, and a periphery;
a die situated on the first surface of the substrate; and
a plurality of molded plastic stiffener-components attached to the first surface of the substrate without an adhesive element, wherein the substrate and the stiffener components are separate components that are attached and secured together.
35. (previously presented) The assembly of Claim 34, wherein the stiffener components are situated at the periphery of the substrate.
36. (withdrawn) The assembly of Claim 35, further comprising a second molded plastic stiffener component secured to the second surface of the substrate without attachment with an adhesive element.
37. (previously presented) The assembly of Claim 34, wherein the substrate is selected from a group consisting of a laminated polymer, a polyimide film, a bismaleimide triazine (BT) resin, an FR4 laminate, an FR5 laminate, a CEM1 laminate, a CEM3 laminate, and a ceramic metal frame.

38-43. (cancelled)

44. (currently amended) A method of securing a stiffener to a substrate, comprising:
applying a stiffener material onto a first surface of a substrate to form a plurality of stiffeners proximate a periphery of the substrate; and

hardening the stiffener material wherein the plurality of stiffeners are attached to the substrate without an adhesive element, and the substrate and the stiffener components are separate components that are attached and secured together.

45. (previously presented) The method of Claim 44, wherein applying the stiffener material comprises a molding process selected from the group consisting of transfer molding, injection molding, and spray molding.

46. (previously presented) The method of Claim 44, wherein applying the stiffener material comprises applying an encapsulating material to the substrate and molding the encapsulating material into said stiffeners.

47. (previously presented) The method of Claim 44, wherein hardening the stiffener material comprises at least one of heating the stiffener material, cooling the stiffener material, curing the stiffener material by means of a catalyst, and curing the stiffener material by exposure to radiation.

48. (currently amended) A method of securing a stiffener to a lead frame assembly, comprising a substrate having a first surface, a second surface, and a periphery, and two or more die situated on the first surface of the substrate; the method comprising:

molding a stiffener material onto a first surface of the substrate of the lead frame assembly to form a plurality of molded stiffeners attached to the first surface of the substrate without an adhesive element, wherein the substrate and the stiffener components are separate components that are attached and secured together; and

singulating the lead frame assembly having the molded stiffeners situated thereon, to separate the two or more die.

49. (previously presented) The method of Claim 48, further comprising, prior to singulating the lead frame assembly, encapsulating at least a portion of the two or more die situated on the lead frame assembly.

50. (previously presented) The method of Claim 48, wherein:
the stiffener material is molded onto the substrate to provide a boundary at least partially around the die on the substrate,
encapsulating said die comprises dispensing an encapsulating material onto the die, and
the molded stiffeners are structured to contain the encapsulating material within said boundary.

51. (withdrawn – currently amended) A method of forming a semiconductor die package, comprising:
securing a die to a first surface of a substrate;
molding a stiffener material onto said surface of the substrate to form a plurality of molded-stiffeners thereon such that the stiffeners are attached to the substrate without an adhesive element, wherein the substrate and the stiffeners are separate components that are attached and secured together; and
encapsulating the die and the molded stiffeners with an encapsulating material to form the semiconductor die package.

52. (withdrawn) The method of Claim 51, wherein encapsulating the die and the stiffeners comprises positioning the substrate with the die and the molded stiffeners situated thereon between two mold plates, and removing the package from the mold plates after the encapsulating material has hardened.

53. (withdrawn) A method of forming a semiconductor die package, comprising:
mounting a die on a first surface of a lead frame;

molding a plurality of stiffeners onto the first surface of the lead frame such that the stiffeners are attached to the substrate without an adhesive element, wherein the substrate and the stiffeners are separate components that are attached and secured together;

applying an encapsulating material to the die and the stiffeners; and

hardening the encapsulating material to produce the semiconductor die package.

54. (canceled)

55. (currently amended) A semiconductor device, comprising:

a substrate comprising first and second surfaces, and a periphery; and

a plurality of molded thermoplastic components attached to the first surface of the substrate proximate the periphery without an adhesive element, the plurality of molded thermoplastic components structured to stiffen the substrate, wherein the substrate and the stiffeners are separate components that are attached and secured together.

56. (currently amended) A semiconductor device, comprising:

a substrate comprising first and second surfaces, and a periphery;

a plurality of molded thermoplastic components attached to the first surface of the substrate proximate the periphery without an adhesive element, the plurality of molded thermoplastic components structured to stiffen the substrate, wherein the substrate and the stiffeners are separate components that are attached and secured together, and
a die mounted on the first surface of the substrate.

57. (currently amended) A semiconductor device, comprising:

a substrate comprising first and second surfaces, and a periphery;

a plurality of molded thermoset plastic components attached to the first surface of the substrate proximate the periphery without an adhesive element, the plurality of molded thermoset plastic components structured to stiffen the substrate, wherein the substrate and the stiffeners are separate components that are attached and secured together, and
a die mounted on the first surface of the substrate.

58. (currently amended) A semiconductor device, comprising:
a substrate comprising first and second surfaces, and a periphery;
a plurality of molded thermoplastic components attached to the first surface of the substrate without an adhesive element, the plurality of molded thermoset plastic components situated proximate the periphery and structured to stiffen the substrate, wherein the substrate and the stiffeners are separate components that are attached and secured together, and
an element situated along the periphery of the substrate and structured for engagement with a processing mechanism for transporting the substrate.
59. (previously presented) The device of Claim 58, wherein the engagement element comprises a plurality of index holes proximate the periphery of the substrate.
60. (previously presented) The device of Claim 58, wherein the substrate comprises a lead frame.
61. (currently amended) A semiconductor device, comprising:
a lead frame comprising first and second surfaces, and a periphery;
a plurality of molded thermoplastic components attached to the first surface of the lead frame along the periphery to stiffen the lead frame, wherein the lead frame and the stiffeners are separate components that are attached and secured together, and
a plurality of index holes proximate the periphery of the lead frame and structured for handling the lead frame by a processing mechanism.
62. (currently amended) A method of forming a semiconductor device, comprising:
molding a plastic material onto a first surface of a substrate proximate a periphery of [[a]] the substrate to form a plurality of molded plastic stiffeners attached to the first surface of the substrate without an adhesive element, wherein the substrate and the stiffeners are separate components that are attached and secured together.

63. (currently amended) A method of forming a semiconductor device, comprising:
applying a plastic material onto a first surface of a substrate proximate a periphery of the substrate by a molding process to form a plurality of stiffeners thereon; and
hardening the plastic material on the substrate to form the stiffeners attached to the first surface of the substrate without an adhesive element, wherein the substrate and the stiffeners are separate components that are attached and secured together.
64. (previously presented) The method of Claim 63, wherein applying the stiffening material comprises a transfer molding process.
65. (previously presented) The method of Claim 63, wherein applying the plastic material comprises a injection molding process.
66. (previously presented) The method of Claim 63, wherein applying the plastic material comprises a spray molding process.
67. (previously presented) The method of Claim 63, wherein the plastic material comprises a thermoplastic material.
68. (previously presented) The method of Claim 63, wherein the plastic material comprises a thermosetting polymeric material.
69. (previously presented) The method of Claim 63, wherein hardening the plastic material comprises heating the plastic material.
70. (previously presented) The method of Claim 63, wherein hardening the plastic material comprises cooling the plastic material.
71. (previously presented) The method of Claim 63, wherein the plastic material comprises a catalyst, and hardening the plastic material comprises curing the plastic material.

72. (previously presented) The method of Claim 63, wherein hardening the plastic material comprises curing the plastic material by exposure to radiation.

73. (currently amended) A method of forming a semiconductor device, comprising:
applying a flowable plastic material onto a first surface of a substrate proximate a periphery of the substrate to form a plurality of stiffeners thereon;
hardening the plastic material on the substrate to form said plurality of stiffeners attached to the first surface of the substrate without an adhesive element, wherein the substrate and the stiffeners are separate components that are attached and secured together; and
mounting a die on the first surface of the substrate.

74. (currently amended) A method of forming a semiconductor device, comprising:
molding a plastic material onto a first surface of a substrate proximate a periphery of the substrate to form a plurality of stiffeners;
hardening the plastic material on the substrate to form said plurality of stiffeners attached to the substrate without an adhesive element, wherein the substrate and the stiffeners are separate components that are attached and secured together; and
mounting a die on the first surface of the substrate.

75. (previously presented) The method of Claim 74, wherein molding the plastic material comprises a process selected from the group consisting of transfer molding, injection molding, and spray molding.

76. (previously presented) The method of Claim 67, further comprising encapsulating at least a portion of the die.

77-84. (canceled)

85. (currently amended) A semiconductor device comprising: a plurality of molded plastic stiffeners attached to a first surface of a substrate without an adhesive element, wherein the substrate and the stiffeners are separate components that are attached and secured together.

86. (currently amended) A semiconductor device comprising: a plurality of molded plastic stiffeners in the form of a plate attached to a first surface of a substrate without an adhesive element, wherein the substrate and the stiffeners are separate components that are attached and secured together.

87. (currently amended) A semiconductor device comprising: a plurality of molded plastic stiffeners in the form of strips attached to a first surface of a substrate without an adhesive element, wherein the substrate and the stiffeners are separate components that are attached and secured together.

88. (currently amended) A semiconductor device comprising: a substrate with a plurality of strips of a molded plastic stiffener attached to a first surface of said substrate without an adhesive element, wherein the substrate and the stiffeners are separate components that are attached and secured together.